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Kamal Jain

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EXAMINER

KARDOS, NEIL R

ART UNIT

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3623

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/715,170	Applicant(s) JAIN ET AL.	
	Examiner Neil R. Kardos	Art Unit 3623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 February 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 and 31-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This is a **NON-FINAL** Office Action on the merits in response to communications filed on February 3, 2009. Currently, claims 1-29 and 31-34 are pending.

Election/Restrictions

Applicant's election of claims 1-29 in the reply filed on July 16, 2008 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Objections

Claims 32-34 are objected to because of the following informalities:

Claims 32-34: Claims 32-34 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claims, or amend the claims to place the claims in proper dependent form, or rewrite the claims in independent form. These claims are directed to computer-readable mediums and systems for performing the steps of claims 1 and 16. These claims are improper because they fail the "infringement test" (see MPEP 608.01(n), Section III). Applying the infringement test, what is needed to infringe claims 32-34 is, for example a CD-ROM or a system having computer executable code that if and when executed would cause a computer to do the steps recited in claims 1 and 16. However, such a CD-ROM or system would not infringe the method steps of claims 1 and 16 since the CD-ROM or system itself never performs any of

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the active steps required by the method of claims 1 and 16. In other words, mere possession of such a CD-ROM or system would infringe claims 32-34, but would not infringe claims 1 and 16. Thus, claims 32-34 are improper dependent claims.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-29 and 31-34 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 1: Claim 1 is directed toward a system. However, the claim does not positively recite any elements that necessarily constitute a system or apparatus, such as computer hardware. Rather, the claim could be directed to software. Software per se is not patentable under § 101; therefore, the claimed invention does not fall within a statutory class of patentable subject matter. *See* MPEP 2106.01.

Furthermore, one may not patent every “substantial practical application” of an abstract idea. *See Gottschalk v. Benson*, 409 U.S. 63, 71-72 (1972). Here, the claimed invention is an abstract idea (approximating a solution to a linear program). Because the claimed invention could be used to approximate solutions to linear programs in any field, rather than being limited to a particular field, the claim covers every substantial practical application of the algorithm. Applicant should amend the claims so as not to cover every substantial practical application of the algorithm.

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Claim 16: Claim 16 is directed toward the statutory category of a process. In order for a claimed process to be patentable subject matter under 35 U.S.C. § 101, it must either: (1) be tied to a particular machine, or (2) transform a particular article to a different state or thing. *See in re Bilski*, 545 F.3d 943, 956 (Fed. Cir. 2008); *Diamond v. Diehr*, 450 U.S. 175, 184 (1981); *Parker v. Flook*, 437 U.S. 584, 588 n.9 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972). If neither of these requirements is met by the claim, the method/process is not patentable subject matter under § 101. Thus, to qualify as a statutory process under § 101, the claim should positively recite the machine to which it is tied (e.g. by identifying the apparatus that accomplishes the method steps), or positively recite the subject matter that is being transformed (e.g. by identifying the material that is being changed to a different state). Nominal recitations of structure in an otherwise ineligible method fail to make the method a statutory process. *See Bilski*, 545 F.3d at 957; *Benson*, 409 U.S. at 71-72. Thus, incidental physical limitations such as insignificant extra-solution activity and field of use limitations are not sufficient to convert an otherwise ineligible process into a statutory one.

Here, the claimed process fails to meet the above requirements for patentability under § 101 because it is not tied to a particular machine and does not transform an article to a different state.

Furthermore, one may not patent every “substantial practical application” of an abstract idea. *See Gottschalk v. Benson*, 409 U.S. 63, 71-72 (1972). Here, the claimed invention is an abstract idea (approximating a solution to a linear program). Because the claimed invention could be used to approximate solutions to linear programs in any field, rather than being limited to a particular field, the claim covers every substantial practical application of the algorithm.

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Applicant should amend the claims so as not to cover every substantial practical application of the algorithm.

Claim 28: Claim 28 is directed toward a system. However, the claim does not positively recite any elements that necessarily constitute a system or apparatus, such as computer hardware. Rather, the claim could be directed to software. Software per se is not patentable under § 101; therefore, the claimed invention does not fall within a statutory class of patentable subject matter. *See* MPEP 2106.01.

Furthermore, one may not patent every “substantial practical application” of an abstract idea. *See Gottschalk v. Benson*, 409 U.S. 63, 71-72 (1972). Here, the claimed invention is an abstract idea (approximating a solution to a linear program). Because the claimed invention could be used to approximate solutions to linear programs in any field, rather than being limited to a particular field, the claim covers every substantial practical application of the algorithm. Applicant should amend the claims so as not to cover every substantial practical application of the algorithm.

Claim 31: Claim 31 is directed toward a data packet. Claims reciting transmission signals or carrier waves per se are not processes, machines, manufactures or compositions of matter; thus, they do not qualify as patent-eligible subject matter under § 101. *See* MPEP 2106; *In re Nuijten*, 500 F.3d 1346, 1357 (Fed. Cir. 2007).

Claims 2-15, 17-27, 29, and 32-34: The dependent claims are rejected for failing to remedy the deficiencies of the claims from which they depend.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 5-14, 31, 32, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson, "A Primal-Dual Approximation Algorithm for Generalized Steiner Network Problems."

Claim 1: Williamson discloses approximating a solution to a linear program, comprising:

- receiving a subset of data corresponding to the linear program (see page 708: Introduction, disclosing given data for a linear program, including an undirected graph, a non-negative cost function, a function, and the set of edges having exactly one endpoint in a set);
- adapting linear programming optimization algorithms, based on separation oracles (see page 709: column 1: full paragraphs 1-2, disclosing separation oracle f ; see also page 709: column 2: paragraph 2, disclosing satisfying f in phases), to work with an approximate separation oracle (see id.) and the subset of data to solve a primal and dual linear program (see page 709: column 1: full paragraph 3 through column 2: paragraph 1, disclosing solving primal and dual LPs; page 710: section

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2, disclosing a primal-dual method for approximation algorithms) within a same approximation factor as the approximate separation oracle (see page 710: column 2, disclosing "Thus the primal solution found is within a factor of a of the optimal primal LP solution, and therefore also within a factor of a of the optimal solution to (IP)"; see also page 709: column 1: first full paragraph, disclosing a solution within a factor of $2k$ of the optimal; page 711: column 1: final paragraph, disclosing "the dual solution found can be transformed into a feasible dual solution for the linear programming relaxation of (IP) of at least the same value", and also disclosing a factor of $2k$).

Williamson does not explicitly disclose a system comprising components that perform the claimed methodology. However, Examiner takes Official Notice that it was well-known in the art at the time the invention was made to automate processes. *See in re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958). It would have been obvious to one of ordinary skill in the art at the time the invention was made to automate the methodology of Williamson by performing it on a system. One of ordinary skill in the art would have been motivated to do so for the benefit of efficiently computing results.

Claim 2: Williamson discloses resolving an optimization of the dual linear program to solve for an optimization of the primal linear program (see page 709: column 1: full paragraph 3 through column 2: paragraph 1, disclosing solving primal and dual LPs; page 710: section 2, disclosing a primal-dual method for approximation algorithms).

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Claim 5: Williamson discloses the approximate separation oracle comprising an approximation algorithm for a minimum Steiner tree problem (see page 708: column 2: last paragraph, disclosing Steiner tree problems).

Claim 6: Williamson does not explicitly disclose the approximate separation oracle utilized in conjunction with an ellipsoid method to obtain a resolution for the primal and dual linear programs. Examiner takes Official Notice that it was well-known in the art at the time the invention was made to use the ellipsoid method to solve linear programs (see e.g. Karr, "Derivation of the Ellipsoid Algorithm"; Wikipedia: "ellipsoid method"). It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ well-known techniques for solving linear programs (i.e. the ellipsoid algorithm) in order to solve the linear programs of Williamson. One of ordinary skill in the art would have been motivated to do so for the benefit of the accuracies and efficiencies associated with the ellipsoid method.

Claim 7: Williamson discloses the resolution producing an approximation algorithm for a fractional Steiner tree packing problem (see page 708: column 2: last paragraph, disclosing Steiner tree problems).

Claim 8: Williamson discloses utilizing primal and dual linear programs representative of a fractional Steiner tree packing problem (see page 708: column 2: last paragraph, disclosing Steiner tree problems).

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Claim 9: Williamson discloses the primal linear program comprising a representation of an aspect of at least one computer network system (see page 708: column 2: second to last paragraph, disclosing "design of networks").

Claim 10: Williamson discloses the subset of data comprising parametric data of a networked system (see page 708: column 2: second to last paragraph, disclosing "design of networks").

Claims 11-14: Williamson does not explicitly disclose the parametric data comprising capacity data, length data, cost data, and latency data. However, Williamson does suggest some of these limitations (see page 708: paragraph 2, disclosing a cost function; page 708: column 2: second to last paragraph, disclosing "design of networks" and "edge connectivity"). Furthermore, these limitations amount to an intended use and are insufficient to distinguish the claimed invention over the prior art because there is no manipulative difference between the claimed invention and the prior art. *See* MPEP 2111.02.

Claim 31: Claim 31 is substantially similar to claim 1 and is rejected under similar rationale. Williamson does not explicitly disclose a data packet. However, Examiner takes Official Notice that it was well-known in the art at the time the invention was made to store data. It would have been obvious to one of ordinary skill in the art at the time the invention was made to store the data from the methodology of Williamson by placing it in a data packet. One of

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ordinary skill in the art would have been motivated to do so for the benefit of efficiently storing information.

Claim 32: Williamson does not explicitly disclose a computer readable medium that performs the claimed methodology when executed on a computer. However, Examiner takes Official Notice that it was well-known in the art at the time the invention was made to automate processes. *See in re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958). It would have been obvious to one of ordinary skill in the art at the time the invention was made to automate the methodology of Williamson by performing it on a computer readable medium and executing it on a system. One of ordinary skill in the art would have been motivated to do so for the benefit of efficiently computing results.

Claim 34: Williamson does not explicitly disclose a device that perform the claimed methodology. However, Examiner takes Official Notice that it was well-known in the art at the time the invention was made to automate processes. *See in re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958). It would have been obvious to one of ordinary skill in the art at the time the invention was made to automate the methodology of Williamson by performing it on a device. One of ordinary skill in the art would have been motivated to do so for the benefit of efficiently computing results.

Claims 3, 4, 16-19, 21-29, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson in view of Karr, "Derivation of the Ellipsoid Algorithm."

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Claim 3: Williamson discloses the optimization of the dual linear program comprising an approximation range between R^* and aR^* ; where a is the approximation factor (see page 710: column 2: equation (b')). Williamson does not explicitly disclose wherein R^* is a minimum value produced by a binary search of an equality function produced via an ellipsoid algorithm utilizing the approximate separation oracle, although Williamson does suggest this limitation (see page 708: column 2, disclosing that $f(S) = k$; column 1: abstract, disclosing that k is the maximum cut requirement of the problem). Karr discloses this limitation (see at least page 4: section 3; specifically, Lemma 3.2, defining the lower bound; page 5: section 3.2, disclosing the iterations to the lower boundary; page 6: figure 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to set the lower bound of Williamson to the minimum value disclosed by Karr. One of ordinary skill in the art would have been motivated to do so for the benefit of obtaining an accurate solution (see Karr: page 5: section 3.2: paragraph 1).

Furthermore, Examiner takes Official Notice that binary searches and the ellipsoid algorithm were well-known at the time the invention was made (see Wikipedia: "binary search algorithm" and "ellipsoid method"). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply well-known algorithms to the methodology of Williamson. One of ordinary skill in the art would have been motivated to do so for the benefit of the efficiencies associated with each algorithm.

Claim 4: Williamson discloses the optimization of the primal linear program comprising a value less than or equal to aR^* (see page 710: column 2: equation (b') and subsequent text).

Claim 16: Claim 16 is substantially similar to elements of claims 1-3, 5, and 10 and is rejected under similar rationale.

Claim 17: Claim 17 is substantially similar to elements of claims 1-3 and 5-8 and is rejected under similar rationale.

Claim 18: Williamson discloses the known approximation method comprising a polynomial time α -approximation algorithm for finding the minimum weight Steiner tree (see abstract).

Claim 19: Claim 19 is substantially similar to elements of claims 3-5 and is rejected under similar rationale.

Claims 21 and 22: Claims 21 and 22 are substantially similar to claim 9 and are rejected under similar rationale.

Claim 23: Claim 23 is substantially similar to claims 10-14 and is rejected under similar rationale.

Claims 24-27: The cited references do not explicitly disclose utilizing the optimum distribution to efficiently transmit non-streaming data from a source node to a receiving node via

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the networked system. Nor do the cited references explicitly disclose incorporating a broadcast transmission, a multicast transmission, or a unicast transmission by the source node. However, Williamson suggests these limitations (see page 708: column 2: second to last paragraph, disclosing "design of networks"). Furthermore, these limitations amount to an intended use and are insufficient to distinguish the claimed invention over the prior art because there is no manipulative difference between the claimed invention and the prior art. *See* MPEP 2111.02.

Claim 28: Claim 28 is substantially similar to elements of claims 1-3, 5, and 10 and is rejected under similar rationale.

Claim 29: Claim 29 is substantially similar to claim 9 and is rejected under similar rationale.

Claim 33: Williamson does not explicitly disclose a device that perform the claimed methodology. However, Examiner takes Official Notice that it was well-known in the art at the time the invention was made to automate processes. *See in re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958). It would have been obvious to one of ordinary skill in the art at the time the invention was made to automate the methodology of Williamson by performing it on a device. One of ordinary skill in the art would have been motivated to do so for the benefit of efficiently computing results.

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Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson in view of Hougardy, "A 1.598 Approximation Algorithm for the Steiner Problem in Graphs."

Claim 15: Williamson does not explicitly disclose an asymptotic approximation factor of about 1.59. Hougardy discloses this limitation (see title). It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the approximation factor of Hougardy to the approximations of Williamson. One of ordinary skill in the art would have been motivated to do so for the benefit of obtaining the most optimal solution.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson in view of Karr and Hougardy.

Claim 20: Claim 20 is substantially similar to claim 15 and is rejected under similar rationale.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Anstreicher, Kurt M., "Towards a Practical Volumetric Cutting Plane Method for Convex Programming." SIAM Journal of Optimization, 9:1 (1998), pp. 190-206.
- Anstreicher, Kurt M., "Ellipsoidal Approximations of Convex Sets Based on the Volumetric Barrier." Mathematics of Operations Research, 24:1 (1999), pp. 193-203.

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- Charikar, Moses, et al., "Approximation Algorithms for Directed Steiner Problems." Proceedings of the Ninth Annual ACM-SIAM Symposium on Discrete Algorithms (1998), pp 192-200.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Neil R. Kardos whose telephone number is (571) 270-3443. The examiner can normally be reached on Monday through Friday from 9 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Beth Boswell can be reached on (571) 272-6737. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Neil R. Kardos
Examiner
Art Unit 3623

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Examiner, Art Unit 3623
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